



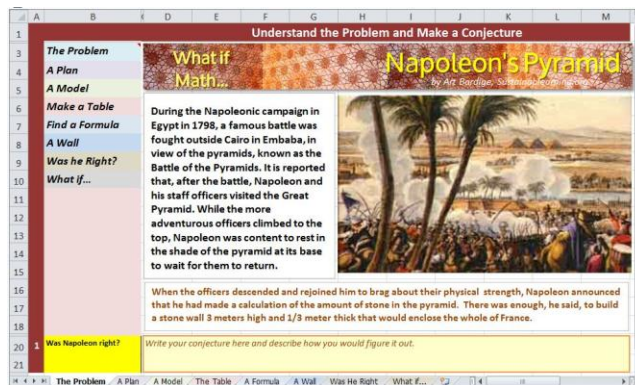
2012 is not 1202

Accelerating the Future of Math Education

Much of the mathematics we require our students to master is obsolete. Leonardo of Pisa introduced it in 1202. In his revolutionary work *Liber abbaci* he brought Arabic arithmetic and algebra into business to replace the cumbersome, slow, and error prone Roman math. Leonardo's content structures our K-12 scope and sequence from whole number arithmetic through algebra 2. What we call the "basics" are not fundamental at all. They are the concepts Leonardo deemed essential for medieval business. His mathematics provided business with the algorithms to compute quickly and the equations to solve "static" problems for 800 years. But it is no longer relevant.

In 1979, a Harvard Business School student, Dan Bricklin, seeking an easier, faster, and less error prone method for modeling complex case studies, revolutionized the mathematics of business. He used a new technology, the personal computer, to replace Leonardo's paper, just as Leonardo's paper replaced the Roman abacus. Bricklin's visual calculator

(VisiCalc) launched a revolution. Spreadsheets have become the ubiquitous tool for quantitative reasoning, profoundly changing the mathematics of the business world. They turn computers into function machines, allowing us to constantly and quickly churn through data, ask *What-If*, model and solve not just static problems but "dynamic" problems as well.



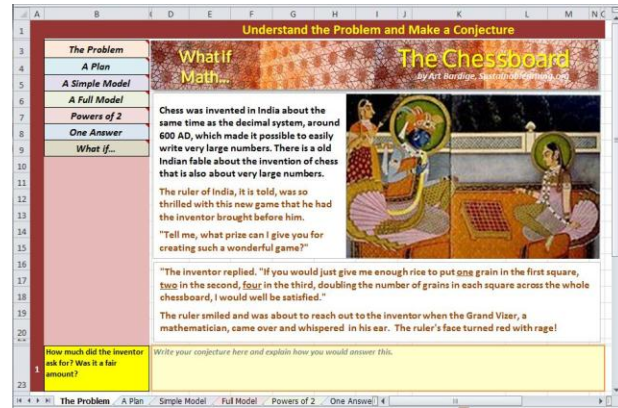
Today, we must ask whether there is any reason students need to spend years mastering Leonardo's math (whole number algorithms, operations on fractions, factoring, solving quadratic equations) especially when many find it so frustrating. Is there any reason children should not be concentrating on learning to solve quantitative problems using spreadsheets? We know the answer. We know, without a doubt, spreadsheets will someday have a profound effect on K-12 education. What can we do to accelerate this revolution?

We can define a mathematics program to prepare our children for their future, shedding the relics of Leonardo's content and rigid scope and sequence with its deficit-learning model. We can provide authentic problems that make learning math inclusive, equitable, exciting, and elastic. And most importantly, we can "instill a passion" for learning in every student, if we build our math program on:

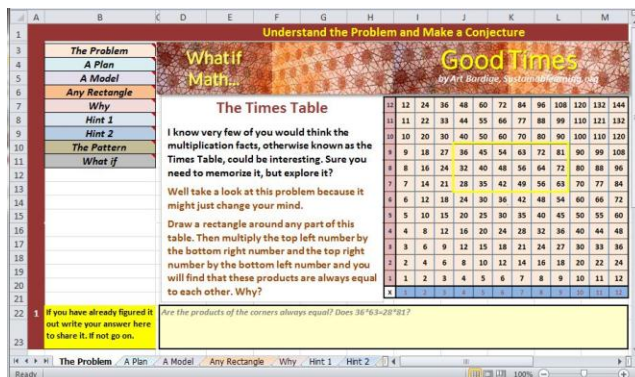
1. **Quantitative Reasoning:** by practicing the skills to reason quantitatively, solving problems through estimation, iteration, communication, model building, programming, and asking "What if?"
2. **Spreadsheets:** by providing these problems on spreadsheets, the ubiquitous quantitative tool of business and by building on the concept of function as the basis for learning higher mathematics
3. **Connections:** by mapping these problems to the topics of other subjects, providing quantitative explorations and experiments, enabling teachers to integrate and unify learning

4. **Choice:** by building 100,000 problems over the next 10 years to personally engage every student with problems authentic to them around their themes and at their appropriate learning level
5. **Creativity:** by using the creativity of our teachers and our workforce to create these great problems, by “multi-sourcing” their development

We are Sustainablelearning. We are a non-profit, providing the math problems of the future that we call *What if Math Problems* to engage students. Our problems are built mainly on spreadsheets. They normally take a class period to complete and resemble a small case study or a short project. We map them to STEM/social studies topics, base them on broad interests (sports, business, physics, nature, finance, food), arrange them by difficulty level, focus them on major math themes, and link them to the Common Core State Standards, especially the *Standards of Mathematical Practice*. We are developing templates to give them a few standard formats. And we will reach out to a wide variety of creative people to develop them. You can find them at www.whatifmath.org.



We invite you to contribute. Bring your creativity to students by building problems. Help us build 500 new problems over the next year. Bring your passion to your students by using our problems. We are



happy to help you through training and/or support to use them as often as you want. Provide us with financial support. We believe we can make a huge impact on math education by initially going through Clay Christensen’s “side door” to Out-of-School-Time programs, problems of the week, STEM programs, financial literacy programs, 12th year math initiatives, and to parents or schools seeking alternative visions for learning using technology.

Join us to accelerate the future of math education.

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